

# Putting the Pressure on Meat... To Be More **Tender** and Possibly **Safer**

**W**hat started as an attempt to make meat more tender may also make it safer to eat.

*Escherichia coli* and other pathogens can live and grow on meat, causing food poisoning if the meat is improperly handled. But concerns about meat being contaminated with dangerous pathogens may be relieved, thanks to research on the hydrodynamic pressure process (HDP).

In 1992, Agricultural Research Service scientists began testing HDP as a way to tenderize meat. They placed the meat in a container of water and then detonated a small amount of explosives to create a shock wave in the water. The shock wave tenderized the meat by severing the stringy striations that can make it tough.

Toughness varies throughout whole cuts of meat. The goal is not only to tenderize the meat, but also to make tenderness more uniform throughout each cut or piece. Studies show HDP treatment does just that. In the future, you may be able to buy a steak with filet mignon tenderness at blade chuck steak prices.

ARS food technologist Morse B. Solomon uses two methods for this research. The original way—placing packaged meat in a plastic garbage can filled with water and a small amount of explosives—certainly makes meat more tender. Unfortunately, it obliterates the packaging and the plastic garbage can.

Several variations of this setup were used—putting the garbage can in the ground, placing it on Styrofoam, and suspending it in midair. “So far, the midair approach gives the best tenderizing results,” says Solomon. He’s the research leader of the Meat Science Research Laboratory in Beltsville, Maryland.

In the second method, Solomon creates an explosion in a metal, thick-walled tank embedded in the ground. Surprisingly, this doesn’t tenderize the meat as well as the standard plastic garbage can. But another benefit arose—there seemed to be fewer bacteria on the meat than before.

At that point, scientists wanted to see whether bacteria were reduced in ground meats as well as in whole meats. Studies were conducted to determine the effect of HDP on naturally occurring spoilage, or shelf-life bacteria, in ground beef. Meat samples were examined immediately after HDP treatment. Shelf-life bacterial populations in the samples showed a 3 log reduction (for example, they decreased from 300,000 colony forming units to 300). A 5 log reduction is the gold standard for bacterial reduction efficiency, so studies are ongoing to further reduce bacterial loads.

Additional studies were performed to ascertain the effect HDP has on *E. coli* 0157:H7 in fresh ground beef, again with encouraging results. The *E. coli* 0157:H7-

seeded ground beef, on examination after HDP treatment, had no detectable levels of the dangerous organism.

Although HDP seems to inactivate most meat pathogens, it doesn’t kill all types of bacteria. “But this may be a good thing,” asserts Solomon. “Lactobacilli, which are harmless, nonpathogenic bacteria, remain.”

Further studies are necessary to determine whether this method can be put to practical use in a commercial setting. “HDP can penetrate a product, reducing or eliminating pathogens throughout ground meat,” says Solomon. “The ability to treat packaged meats may substantially reduce health risks in the future.”—By **Sharon Durham**, ARS.

*This research is part of New Uses, Quality, and Marketability of Plant and Animal Products (#306) and Food Safety (Animal & Plant Products) (#108), two ARS National Programs described on the World Wide Web at <http://www.nps.ars.usda.gov>.*

*Morse B. Solomon is with the USDA-ARS Meat Science Research Laboratory, Bldg. 201, 10300 Baltimore Ave., Beltsville, MD 20705-2350; phone (301) 504-8463, fax (301) 504-8438, e-mail [msolomon@lpsi.barc.usda.gov](mailto:msolomon@lpsi.barc.usda.gov).* ♦

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Research leader Morse Solomon looks on as microbiologist Anisha Williams-Campbell prepares a sample of ground beef for microbiological analyses following HDP treatment.